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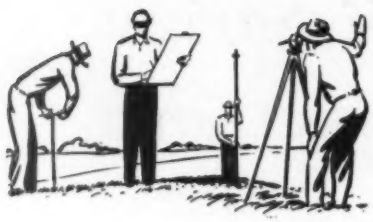

God has lent us the earth for our life; it is a great entail. It belongs as much to those who are to come after us, and whose names are already written in the book of creation, as to us; and we have no right, by anything that we do or neglect, to involve them in unnecessary penalties, or deprive them of benefits which it was in our power to bequeath. And this the more, because it is one of the appointed conditions of the labour of men that, in proportion to the time between the seed-sowing and the harvest, is the fulness of the fruit; and that generally, therefore, the farther off we place our aim and the less we desire to be ourselves the witnesses of what we have laboured for, the more wide and rich will be the measure of our success.

—THE SEVEN LAMPS OF ARCHITECTURE
BY JOHN RUSKIN

VOL. XXIX, NO. 5 DECEMBER 1963

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COVER PICTURE—Portion of new plat for Long Grove Country Club Estates development in Lake County, Ill., showing golf course fairways relocated on the basis of soil surveys to leave more favorable sites for home building. (See pp. 107-109.)

Soil Conservation

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FRANK B. HARPER, Editor

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Lake County Uses Soil Survey In Planning Its Urban Areas

By John Quay

WE are using soil facts in urban planning in Lake County. We will make even better use of them as soon as soil survey maps are available for this entire Illinois county and the maps and terminology are translated into terms more meaningful to the professional planner or interested lay citizen.

The Ela Township survey, completed in March 1962, was the pilot study that proved to our Lake County Regional Planning Commission and our County Board of Supervisors that we were started in the right direction. We now are embarked through technical services of the Soil Conservation Service in a survey of the entire county. It will help us deal with our continuing urban expansion problems.

As chairman of the Ela Area Planning Board and vice-chairman of the County Planning Commission, I am interested in both regional and detailed planning. In the 6-county Illinois part of the Chicago metropolitan area, 6.2 milllion people are using about 30 percent of the land area for urban purposes. Lake County's share of the metropolitan total is 300,000 people, again using about 30 percent of the land area. The other 70 percent of the county is agricultural land, forest preserves, lakes, and miscellaneous undeveloped tracts.

While the surge of population growth outward from Chicago will continue, even the most optimistic population projections for the next 20 to 40 years do not indicate that all nonurban land will be needed for urban uses. It would therefore seem reasonable that a prudent planning official would want to guide urban interests toward geographical areas best suited for such development. And, going one step further, he would want to advise both public and private interests of the hazards and opportunities within a geographical area.

Soil mapping for farmers and ranchers has pointed out alternative methods of using the land and saved rural landowners from trying to grow crops unsuited to their environment. A kernel of corn, planted in a soil with an excessively high water table, will have a difficult time germinating and growing to maturity. Houses, roads, factories, and public buildings "planted" in saturated soils will, like the corn plant, have to divert some of their growth resources to overcoming water-related problems.

Practices that have worked well on farmland sometimes do not fit urban needs. Tile drainage is an example. When the land use changes from farming to an urban use, and the drainage system is no longer maintained or is destroyed, the field tends to revert to natural conditions that existed prior to installation of the system. When this happens, and houses are built in the area, we have flooded basements, roads that prematurely disintegrate, septic systems that do not operate properly, lawns that will not grow grass, and a general community liability instead of a fine residential area.

Planners in metropolitan areas and other urban-rural communities throughout the country are making practical 20th century application of the lesson taught by the Biblical story of the foolish man whose house built on the sand fell when the rain descended and the floods came and the wise man whose house built on a rock fell not. They have learned there need be no such "foolish" home builders in this day when scientific information is available to tell them beforehand if the footing for their houses is sound.

This information being relied upon by more and more local planners, zoning and other authorities, and builders is contained in soil surveys. Long used primarily as guides for farmers in growing their crops, these diagnoses of soils, charted in detail on reference maps, are equally useful in showing whether a given piece of land is suitable for buildings, underground sanitary or other utility systems, for streets or highways, or for other essential facilities. If it is not suited to such uses, the soil surveys tell planners, landowners, and developers whether the soil properties, water-table level, slope, and other factors indicate the land may be used to better advantage for agricultural, recreational, or wildlife purposes.

This issue of SOIL CONSERVATION presents the first-hand experience of planners and developers with the successful use of soil survey and related land-use guides in one representative locality beset by urban growing pains—Lake County outside Chicago, Ill. The rewarding lessons they have learned there apply as well in principle in urban growth areas anywhere.

Here, planner, developer, sanitary engineer, soil scientist, and conservationist together tell, step by step, how the job is being done in Ela Township and Lake County. Other examples of soil survey use may be found in these issues of SOIL CONSERVATION: December 1962, October 1962, November 1962, November 1963, and others.

The author is vice-chairman of the Lake County Regional Planning Commission, Barrington, Ill.

Chairman Quay (r.) and Ela Area Planning Board members study soil interpretation maps. (His left): John Walt, Clarence Voras, Harold Wilder, Larry Hartlaub, Walter Dobbins, Henry Knigge, Rita Cole.

Soil mapping with agricultural interpretations provides the basis for an agriculturally oriented, colored land capability map. Urban planners need colored capability maps, too; and this is exactly the way we are using facts turned up by the Ela Township soil survey and other township surveys currently being completed.

With help from our commission's director and staff, we have prepared seven colored capability maps, all based on interpretations given in the Ela survey. All have special significance in urban planning. Interpretations, each on a separate enlarged map, include: Percolation rate, bearing strength, degree of slope, flooding potential, depth to water table, corrosion potential and agricultural capability.

To be consistent, we used the same color code to cover different degrees of hazard in each interpretation as are found in the widely used farm land capability maps. Thus green shows absence of special problems, yellow is in the area of caution, and red is in the danger zone.

Translation of cold facts into a visual presentation of this kind is important to us in Lake County, because it enables us to do more positive planning based on understandable facts. Up to this time, not having specific information that we could easily communicate to others, we sometimes have had to be defensive in our operations. Let me explain:

A subdivider went to a local village planning commission a while back with a request to put a new road along the edge of a swampy area. Looking at the swamp grass and cattails and examining the soil maps, the planning officials questioned the wisdom of the location. When he persisted, the village authorities prescribed special requirements for construction and maintenance that placed the major responsibility on the sub-divider. Use of soils information thus protected local taxpayers from heavy repair costs if the road should sink or break up.

However, if the soil facts had been used in a positive manner to begin with, the road could have been kept back on high ground and the spoiling of a potential lake site prevented. Such a change also would have made it unnecessary for pedestrians to cross the road to reach a future recreation area.

Few of our urban problems can be corrected economically after the wrong land-use decision has been made, but a great many can be prevented before the decision is made. As county officials, we on the County Planning Commission are available to give advice and assistance to 45 local municipalities. We and other planning bodies advise developers, individual property owners, locally elected officials, attorneys, civic groups, and representatives of industry, transportation, and utilities.

In Lake County alone, 2,000 or more elected or appointed officials are in a position to make or to influence decisions on land use. When we on the commission work with them, we can't afford to be negative. We should be able to give the facts in 30 seconds, while the inquirer is interested and before he makes a decision. The colored interpretive maps are the best way we have found to reach the individuals involved.

The right soils information at the right time can prevent a lot of idle talk. Arguments about physical problems at a given site can go on for hours, because of defects in memory, differences in vantage points, and lack of understanding. Precise soil descriptions and interpretations can be an immediate conversation-stopper at many conferences, particularly when presented visually.

For example, a developer recently presented to the planning commission of an Ela Township village the plat of a proposed subdivision. Looking at the soils map, we found one lot to be entirely in a depressional area. The soils had a high water table, and during most of the year septic system performance would have been zero. Filling the hole would not have been a solution, as the basement footings still

would have rested on wet, unstable soils.

With the soils information, we were able to point out these facts. As a result, the developer will put homes on either side of the undesirable building site, and the low area will be available for recreation or wildlife.

Monetary losses are usually sustained by the people who can least afford them—young couples who put a heavy mortgage on a $13,000 home built on a flood plain, or who buy a split-level home that actually does split because of settling. For many people, also, home-buying brings on a highly emotional condition. When they decide to buy a home, they have a dream in mind, and things they see that tie in with the dream may loom out of proportion to other considerations.

When they move in and the walls crack, the basement floods, the septic system doesn't work, the grass won't grow or plantings die—because of unsuspected soil deficiencies—the disillusioned home buyers usually are left holding the bag. Their reaction is to lay the blame on anyone who might have been involved—public officials, the developer, builder, or real estate broker, and sometimes even the neighbors. Intelligent use of soils information by all concerned can help prevent such misfortunes. An erodible 18 percent slope, for example, sometimes does not show up on a developer's plat; and any level land covered with grass looks good to the inexperienced buyer, though it actually may be too wet or otherwise unsuitable for home building.

In the North Libertyville estates, which were on a flood plain of the Des Plaines River, 120 families had to be removed from their homes in a 1960 spring flood. The Lake County Red Cross estimated damages at $200,000. In a subsequent town meeting, the heavy turnout of voters from this subdivision helped to vote in a proposed soil-mapping project for the township. They were willing to vote their tax money for this means of helping to prevent future home building on flood plains.

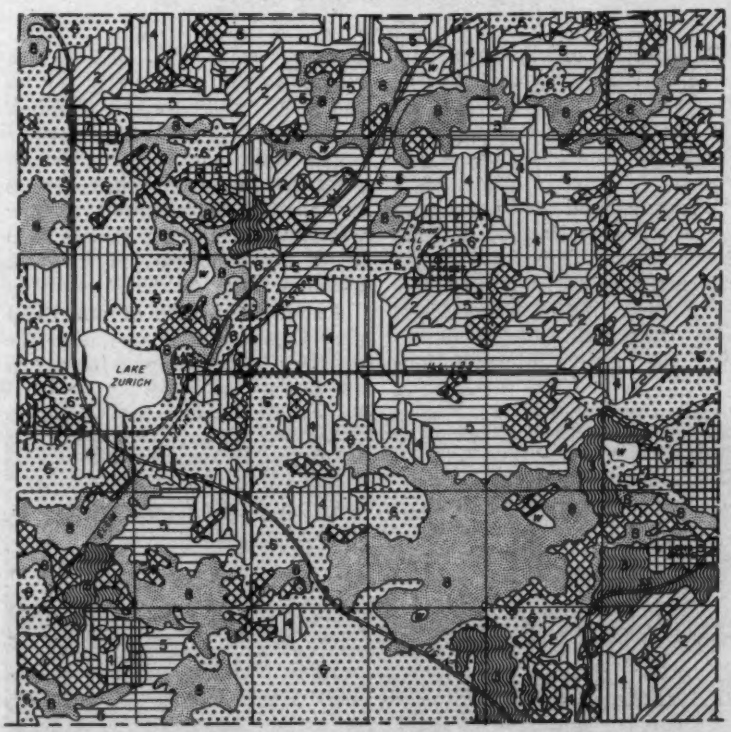
In recent months there has been an increased awareness among our public officials of the need for soils information when working with urban development problems. One example: A Vernon Township schoolboard member asked for a statement on soil problems likely to affect construction of an addition to a school. And he wanted the information before working on a bond issue—not after the project got under way.

Because use of soil maps is a new approach in urban planning in local governments, we may have a tendency to seek dramatic applications; but the real benefit to the public lies in our using this information in such ways as these:

(1) Realinement of a subdivision road a hundred feet to one side in order to miss a spot of structurally unstable soil.

(2) Reshaping of a lot in order to include a more porous soil for the septic field.

General Soils Map of Ela Township


LAKE ZURICH
LEVEL WET SOILS DEVELOPED IN ORGANIC AND STREAM-LAID MATERIALS
Houghton-Otter-Sawmill Association
LEVEL TO GENTLY ROLLING SOILS DEVELOPED IN MEDIUM-TEXTURED GLACIAL DRIFT
Symerton-Corwin Association
Tuscola-Grays Association
LEVEL TO GENTLY ROLLING SOILS DEVELOPED IN SILTY CLAY LOAM GLACIAL DRIFT
Elliott-Martinton Association
Varna-Elliott Association
Morley-Beecher Association
Blount-Morley Association
GENTLY ROLLING TO HILLY SOILS DEVELOPED IN SILTY CLAY LOAM GLACIAL DRIFT
Morley-Varna Association

THIS?—Typical flooding in 1960 and 1962 in subdivision built on Des Plaines River flood plains.

(3) Selection of plantings for a park or parkway on the basis of soil types.

(4) Building of a dam and lake on soils not suitable for house construction.

Lacking a backlog of experience in the total application of soils knowledge to urban development problems, we in Ela Township—to say nothing of the county as a whole—have only started to explore the many interpretations from one soils map. One is with respect to the opportunity for recharge of ground-water supplies, a growing problem throughout our area. With the construction of reservoirs in the more suitable sites and better management of our water, we should be able to help assure a continued supply of good, usable water.

Another objective of our Planning Commission is up-dating the county's 1939 zoning ordinance in line with today's developments and future needs, with the help of land-use studies and a long-range plan. Soils information now becoming available is proving most useful in this work.

Township and village planning officials also are interested in coordinated development and the improvement of zoning ordinances. The Ela Area Planning Board has representatives from each of the six villages in the township. They review plats submitted by developers and coordinate overall planning and development. A good example was the use of soils data by the village of Long Grove during recent negotiations with a local developer for the more than 500-acre Long Grove Country Club Estates, a combination golf course and homesite development.

Undercut culvert and eroding ditchbanks in a new subdivision.

In an area of rapid and varied development such as exists in Lake County, there must be constant vigilance by these local officials to see that each daily decision adds up to a sensible and imaginative future. As we on the County Planning Commission work with them, it is good to know that we have an effective tool in the soil survey, that will be applicable to both the incorporated and unincorporated areas of our county. We are looking forward to the day when surveys like that for Ela Township will cover the entire county.

OR THIS?—There is no flood danger for this properly located play area in Plum Groves Estates in Cook County.

Ela Township Planning Involves 119 Soils

By Raymond L. Newbury and William H. Bender

SURVEYING Ela Township's 119 soils was a first essential to planning solutions to land and water problems caused by rapid urbanization of this Illinois area some 30 miles northwest of the Chicago Loop.

Six-mile-square Ela Township in

Co-author Bender uses soil profiles to explain differences in Ela Township's 119 soils to planners and developers.

Lake County originally was developed for farming, which still is an important land use there; but much of the land now is being converted to use for residential, transportation, industry, and recreation facilities. A mixture of rural and urban land uses in the township presents complex soil and water problems to both the farmer and city dweller. The more than a hundred different soils occur in 2- to 30- acre areas.

The most serious soil and water problems encountered by urban developers are flooding, seasonal high water tables, corrosion of utility pipes, poor septic tank functioning, and foundation failures. These problems often don't show up until after the investment has been made for construction of buildings and installing facilities.

Some means was needed to anticipate these problems, and the people in Ela Township asked the Soil Conservation Service for help with a soil survey that could provide the needed information. Soil scientists walked all over the township digging holes to examine and identify the soils, and recorded their findings on 4-inch-to-the-mile aerial photographs.

The soils were found to occur in a complex pattern, influenced by the kind of geological material and the topography of the land surface. Repeated soil borings had to be made in order to make adequate soil maps.

To the 5-foot depth, the random dominant deposits consist of medium textured material (containing coarse, cobbly gravels), laid down by glacial meltwater, and silty clay loam materials deposited by the glacier itself. There also are numerous, scattered depressional areas containing organic (muck) materials, and narrow stream bottoms in the eastern part of the township contain alluvial materials. Knobby hills and swampy depressions are combined in a highly uneven land-surface pattern. Surface drainage is not well developed, and the numerous depressions tend to collect runoff water from adjacent slopes.

Even on the general soils map—developed to present the "big picture" after the detailed soil maps were completed—the "ingredients" of 119 soils look as if they had been stirred by a giant spoon, though each of the 8 general soil areas has a relatively uniform pattern. This general soil map is useful to those who want to compare broad areas within the township, and provided a means for making general predictions as to the kind and frequency of problems encountered by rural and urban

"Good cow pasture—but will it do for people?" (L. to r.): Planner John Quay, Co-author Newbury, and SCS Conservationist Elmer Offerman.

land users and by county and regional planning people.

At the community and village levels of planning, it is the detailed soil maps that become the basis for obtaining a "close look." Interpretations are broken into great detail for the five major land uses—agricultural, residential, industrial, transportational, and recreational.

Under agricultural use are interpretations in relation to each soil: (1) By capability classification—use potentials, and risks and limitation in use; (2) management—best use and conservation treatment needed; (3) crop yield estimates; and (4) crop adaptations. The soils also are interpreted for their suit-

The authors are assistant State soil scientist and soil correlator for interpretations, both of the Soil Conservation Service, Urbana, Ill.

A bleak prospect for new homeowner—who finally got lawn to grow where topsoil was stripped off.

ability for growing wildlife food and cover.

There likewise are guides for planting lawn grass, shrubs, vines, and trees in relation to the different soils, and for water management in terms of flooding hazards, agricultural drainage, and sprinkler irrigation.

The engineering properties and interpretations of the soils are quite detailed in the soil report prepared for Ela Township.

First, are data showing the results of six standard laboratory and field tests. From these data and other observations, tables were compiled for (1) pH (soil acidity or alkalinity), (2) hydraulic conductivity, (3) percolation rate, (4) bearing strength, (5) shrink-swell potential, (6) erosion potential, (7) susceptibility to frost, and (8) susceptibility to erosion. Additional tables show suitability for (1) septic tank disposal fields, (2) building foundations, (3) trafficability, (4) road subgrades, (5) winter grading, (6) road base, (7) sand or gravel, (8) topsoil, (9) compaction character, (10) pond embankments, and (11) pond lining materials.

The soil scientists who made the Ela Township survey suggest a number of imperative requirements for such a survey:

A consistent high quality of soil maps is needed. This means that experienced soil scientists must do the job.

For the soil maps, use the best available photographs. Use 8-inch-to-the-mile field sheets if the complexity of soil and land patterns are extreme. Delineate small areas (even less than 1 acre) of real problem soils, such as the mucks. Make a greater than normal number of borings to verify soil identification. It is most desirable to make soil maps when the soils are moist and the crops are less than "head high."

Talking and working with county, township, and village planning people, with the tax assessor, and with the local Health Department people is necessary. It also is important to talk with as many other people as possible, to learn their experience with wetness, flooding, septic tank function, and so on. Such information helps the soil scientist assess the soil properties of permeability and percolation as related to septic tank filter field function; flooding and ponding potential and surface waterflow character for lowland sites; and marsh and high water-table areas, especially where there are abandoned farm drainage systems.

A study of geologic literature, along with drill-rig borings, similarly help dispel many questions about depth to bedrock. Watch for potential sites for future "dry" ponds, for future ground water recharge use.

Remember during the survey, and in preparing the report and dealing with the people who will use the information, that there are limitations in any soil survey. Urban planners want to know the kind and degree of problems and limitations in land use; but soils are only one of many phases that the planners consider, and they may tend to take the soils information as being so reliable they can reduce the onsite investigation.

A building lot with a septic tank field, for example, cannot be evaluated adequately on the basis of a soil survey alone. The soil survey serves as a dependable guide, or preliminary investigation, to the location of suitable sites for construction of buildings and installation of other facilities. But even in survey maps of high quality, we must allow for the fact that up to 15 percent of soils of a different kind than that indicated for a given area may occur.

Furthermore, planners need to understand that soil-unit lines delineated on maps never can be so precise that they can be laid out with pegs and string on the land with the statement "that side is all good—this side is all bad."

And, of course, much yet is to be learned through research and experience about the full properties of many soils for urban use. Until we have more information, interpretations must be based on presently known facts, because studied conjectures will not suffice and even can be dangerous. On the other hand, many facts are known and proven, and these are available in a soil survey. Used within its limitations, the survey, along with adequate onsite examinations, can help planners not only to avoid costly mistakes but also to develop a much more satisfactory situation for human living and enjoyment.

Soil Surveys Help People Make Of Their Land What They Wish

By Charles E. Kellogg

THE American people can make of their land what they wish. Few other countries have such flexibility.

Unlike several crowded countries, we have abundant good land. We have many different kinds of soil that are good for farming. We have many that are good for houses, for playgrounds and parks, for trees, and for grass. We do not need to use unsuitable soils for any of these purposes. We do not need to crowd the houses for increases in population onto poor soils for houses. We need to have neither rural nor urban slums.

The same principles that lie back of the great agricultural improvements of the last two decades in the United States can be applied as well to the rural-urban space being filled by our increasing population. What we have learned about selecting soils for farm and forestry use can be applied equally well to selecting soils for housing, highways, golf courses or other recreation facilities, and for other uses. We have no need whatever to put houses where they may slide down hill, settle and crack, or be flooded; or where they cannot be beautified with growing plants.

The same can be said of the principles for managing soils for the conservation and use of water. They, too, are applicable to the rural-urban complex around our cities and along our highways.

The underlying principles of runoff control, drainage, irrigation, and the storage of water for agricultural uses apply in urban areas. Unhappily, this fact is not yet well known. Some of the worst runoff and erosion is taking place within the city limits and in

The author is deputy administrator for soil surveys, Soil Conservation Service, Washington, D. C.

Man can misuse the land—tear the earth apart to put up his puny buildings where it best suits his convenience and pocketbook.

Or he can plan attractive developments like this on a former Maryland dairy farm near Washington, D. C.

the urban fringes around them, especially during the development period.

The same is true of principles and devices for growing plants. With a medium of attention and cost during development, trees can be preserved and the soil left in good condition for growing ornamental shrubs and other plants around homes. These principles also apply in using grass and other plants on street and highway rights-of-way and other areas where earth is disturbed in construction.

Americans now have an opportunity to develop new living space with advantages of both country and city. Within this space we can have fields, forests, parks, water surfaces, and abundant wildlife. At the same time, we can allow enough density of homes to support efficient schools, shopping areas, clubs, and other centers of city life. Both the country families and the city families can have richer lives.

Soil classification and mapping of our rural lands began in 1899, and today has been extended to many urban landowners as well. These soil surveys are made by the Soil Conservation Service in cooperation with the State agricultural experiment stations and other State and Federal agencies having immediate needs for them.

Engineering interpretation of the basic soil classification used in soil surveys began in the Michigan State Highway Department during the winter of 1925-26. The benefits in cheaper and longer lasting highways were enormous. Yet the methods spread slowly until World War II, when they were widely applied in military engineering. Since 1950, both the data for engineering interpretation of our thousands of kinds of soil and the use of these interpretations with soil maps have increased, until now much of this work is going forward in both rural and urban areas.

Local support for soil survey work in some urban areas came only after some sort of catastrophe, such as costly failures in roads, houses, sewage fields, or other expensive structures. Depending upon the kinds of unsuitable soils used, houses may have wet foundations during certain seasons, be flooded irregularly during stormy periods, or even slide down the slope. Sewage fields oftentimes fail to function, houses settle unevenly and crack as the soil swells and shrinks, and many house lots are extremely difficult to beautify with living plants.

The cost of soil surveys for orderly planning is only a fraction of that of failures or unneeded overdesigns. Yet the opportunities from improved soil use go way beyond the prevention of such costly failures, which are almost inevitable without good basic soil surveys made before site location and construction. And because we have soils that are suitable for housing in the urban-fringe areas, the bad sites can be avoided.

If he fails to build on the right kind of soil, his houses crumble.

Or his highways break up and—like this one—have to be relocated.

Areas of good and poor soils are usually intermingled as an intricate pattern. Thus, by planning the location of houses and streets to avoid building houses on the poor soils, we almost automatically reserve the other soils for trees, playgrounds, and nature-study areas. Many kinds of soil highly suitable for summer-growing crops are too wet in winter for housing and accordingly are better used for farming.

People concerned about maintaining high-quality outdoor playroom for youth see this as the most important long-run benefit of planning with soil surveys. The big need for recreational areas, with trees and shrubs and animals, is in the local communities where the boys and girls live, not in some distant park. Every boy and girl should have such a place within easy distance by foot or bicycle.

Provision for these areas need not be expensive. But if the bulldozers tear up these soils and houses built on them fail, the community has a costly and messy place instead. One can see how planning with the benefit of soil surveys works out in Lake County, Ill. Or he can see it around Charleston, S.C., or San Antonio, Tex., in Fairfax County, Va., and in many other places.

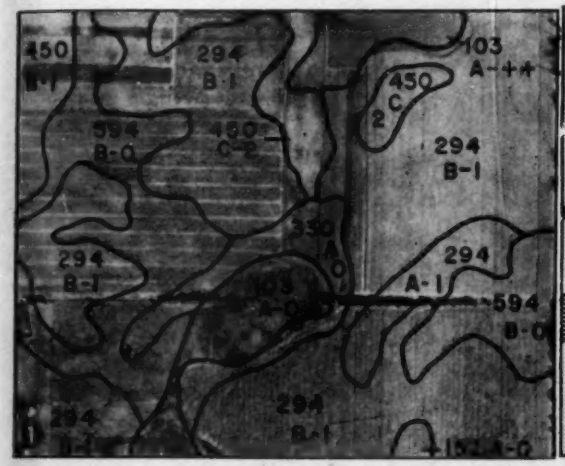
A person buying a home or a lot to build on should look closely at the soil or, preferably, have someone skilled in soil science do it for him. A little care can keep his "dream house" from going down the slope or the health office from condemning it.

Golf Course—Homesite Developer Revamped Plan To Fit the Land

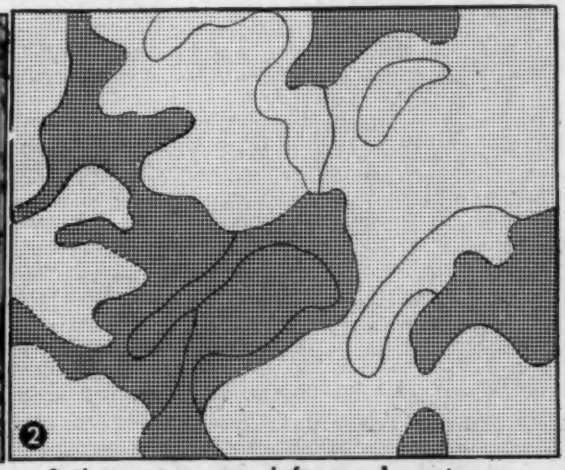
By Roy C. Anderson

LONG GROVE Country Club Estates is a 525-acre combination golf course and homesite development. My experience as a developer begins and ends with it. Nevertheless, it is a good example of a changing pattern of physical layout of new homesites in this northeastern Illinois locality as a result of more aggressive planning by local officials.

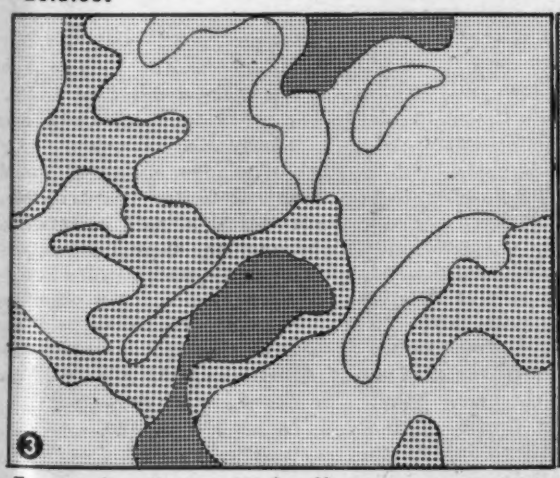
With the new emphasis on orderly urban and suburban growth, restrictions on subdividers are growing tighter, here in Lake



Map with symbols showing kinds of soil on 130-acre area of Long Grove Country Club Estates.



Soil map interpreted for area's wetness limitation for housing development: None to slight; severe.

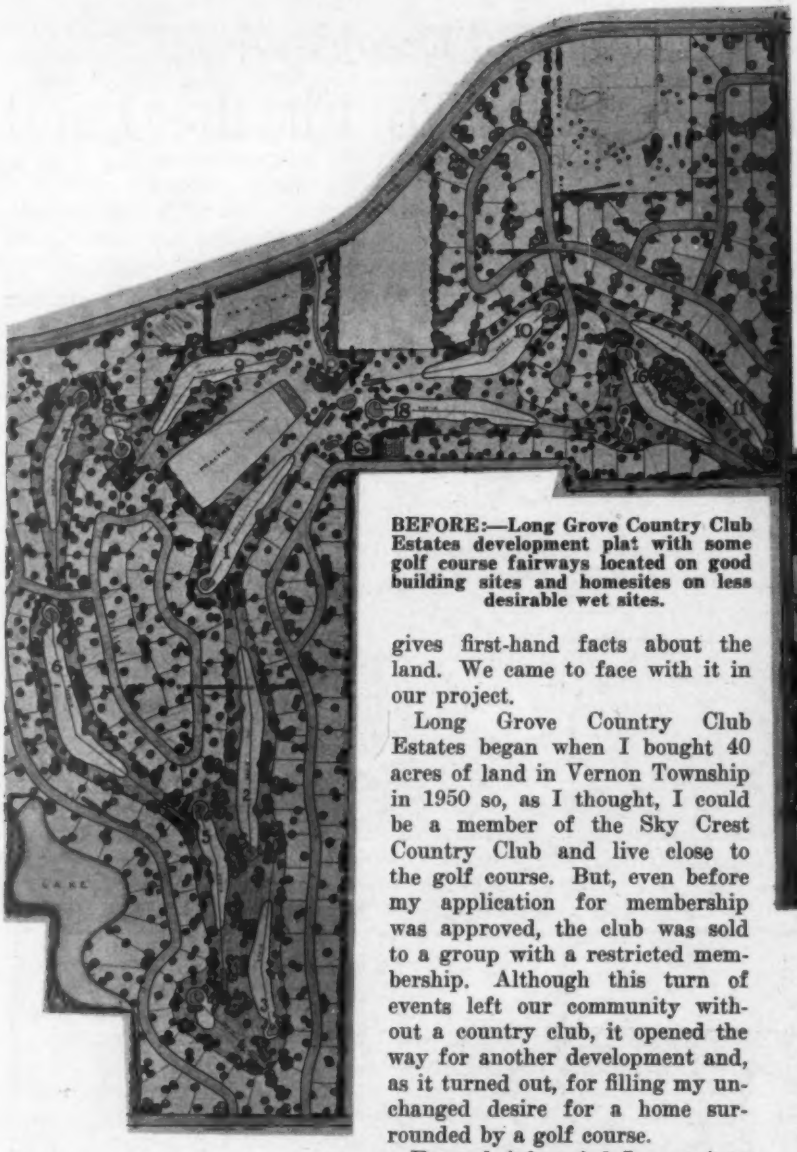


For its bearing strength affecting construction of buildings and roads: High; moderate; low.

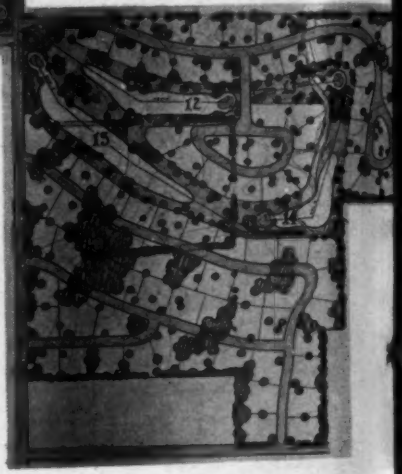
For its limitations for recreation development Few; moderate; many.

(See coyer and other pages.)

Urban-Area Soil Map Interpreted



BEFORE:—Long Grove Country Club Estates development plat with some golf course fairways located on good building sites and homesites on less desirable wet sites.



County as elsewhere. Zoning ordinances are being enforced, and many special requirements are being added in the public interest. Now a new tool is being made available to both developers and elected officials that will play a major role in the design and layout of future residential housing. It is the detailed soil survey that gives first-hand facts about the land. We came to face with it in our project.

Long Grove Country Club Estates began when I bought 40 acres of land in Vernon Township in 1950 so, as I thought, I could be a member of the Sky Crest Country Club and live close to the golf course. But, even before my application for membership was approved, the club was sold to a group with a restricted membership. Although this turn of events left our community without a country club, it opened the way for another development and, as it turned out, for filling my unchanged desire for a home surrounded by a golf course.

For a brief period I went into farming, buying additional land to make an economic unit. But after the cattle market broke in the early 1950's, I discontinued operations and rented the land to other farmers in the area. About 8 years ago, my dream of the present development began to form, and my last few land purchases were made to round out the acreage I needed for it.

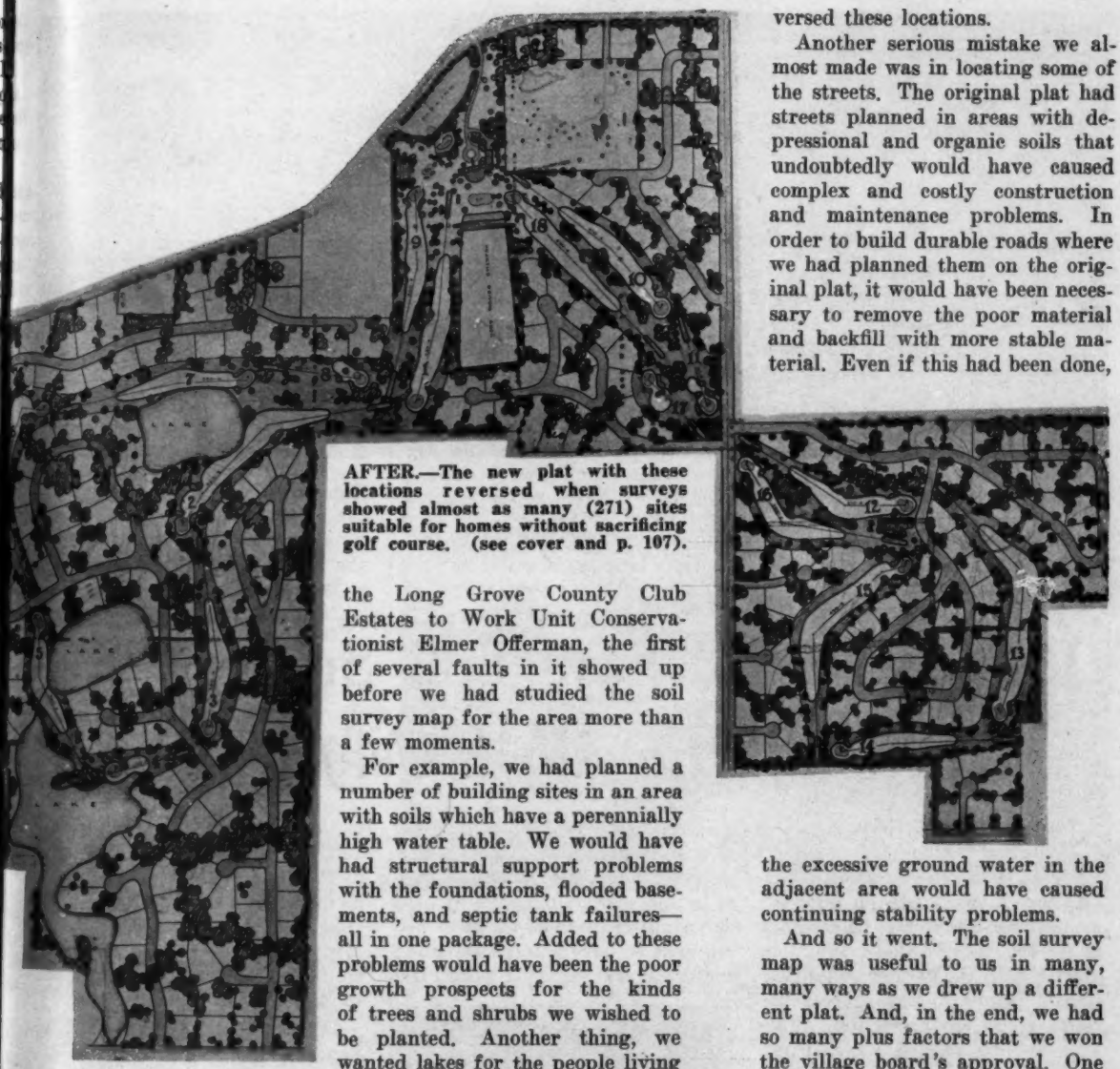
The next step was to engage an architect to prepare a layout for the golf course and some "prestige" homesites. In doing so, I discovered that I would have to satisfy not only myself but the officials of Long Grove village in Vernon and Ela townships.

It was my idea to break the land that would be set aside for homesites into about 1-acre lots. However, my development had to be laid out in detail and approved by the village before I could employ a professional planner. So I had an architect draw up a plat—which seemed to me to be an excellent layout—and took it to the village board. This was before either the architect or I knew that a soil survey had been made of nearby Ela Township.

The idea of 1-acre lots didn't appeal to the board. They were skeptical of such a marked deviation from their Long Grove zoning rules which called for 2- and 3-acre lots in this location. In negotiating with them, I tried to show that the crux of the matter really was the density of housing for the total project. There were to be 150 to 160 acres of open land in the golf course and about 30 acres in dug lakes. My home takes out 17 acres, leaving 271 housing sites in the 525 acres.

This arrangement didn't con-

The author is developer of the Long Grove Country Club Estates, Long Grove, Ill.



AFTER.—The new plat with these locations reversed when surveys showed almost as many (271) sites suitable for homes without sacrificing golf course. (see cover and p. 107).

ince the board, either, as they ere afraid of water and septic nk problems. One member called ttention to water tables in the ea and proposed that I check ith the local Soil Conservation ervice office to find the best build- g sites—not wait until the land d been developed before dis- wering the mistakes. And this the way we got introduced to e Ela Township soil survey.

When we showed our plat for the Long Grove County Club Estates to Work Unit Conservationist Elmer Offerman, the first of several faults in it showed up before we had studied the soil survey map for the area more than a few moments.

For example, we had planned a number of building sites in an area with soils which have a perennially high water table. We would have had structural support problems with the foundations, flooded basements, and septic tank failures—all in one package. Added to these problems would have been the poor growth prospects for the kinds of trees and shrubs we wished to be planted. Another thing, we wanted lakes for the people living there to enjoy. Further study revealed that this part of the area was a promising site for an additional lake.

By that time, we began to realize it would be necessary to change the plat. Then we learned that some of the fairways for the golf course were planned on excellent building sites, while some of the lots adjacent to these fairways were planned on less desirable construction sites. In developing our revised plat, we simply reversed these locations.

Another serious mistake we almost made was in locating some of the streets. The original plat had streets planned in areas with depressional and organic soils that undoubtedly would have caused complex and costly construction and maintenance problems. In order to build durable roads where we had planned them on the original plat, it would have been necessary to remove the poor material and backfill with more stable material. Even if this had been done, the excessive ground water in the adjacent area would have caused continuing stability problems.

And so it went. The soil survey map was useful to us in many, many ways as we drew up a different plat. And, in the end, we had so many plus factors that we won the village board's approval. One of the most convincing was our willingness to make a completely new plat for the area, with golf course and homesites laid out to fit the land and the soils.

Without the use of the soils information, it is altogether possible that the future "dream homes" of some folks in Long Grove Country Club Estates might have been turned into nightmares of septic-tank and water worries. Such a situation wouldn't have been good for the golf course enterprise,

Developer Anderson (l.) and Chicago Architect Robert Bruce Harris go over plans for homesites and golf course.

This inviting golf course is at Barrington in Lake Cuba Township.

either, because most of the membership for the country club likely will come from the estate residents. Those are some of the reasons we are happy with the way the whole venture is turning out.

Health Official Says Soil Survey *"One of the Most Useful Tools"*

By John G. Morris

THE U. S. Public Health Service's committee on environmental health problems pointed out in its 1962 report that population growth with the greater concentration of people in urban areas has aggravated environmental problems in two related ways. First, quantities of air, water, and land resources available to each individual are being reduced. Second, the increased amounts of waste products are bringing even greater increases in their effects on people.

In Lake County, Ill., on the fringe of Chicago's burgeoning metropolitan area, we are especially conscious of these problems. We know we must use all the scientific knowledge at hand and maintain constant vigilance to give our people clear air, pure water, healthful food, and comfortable shelter.

In the search for ways to meet the challenge, one of the most useful tools we have found is the information in soil survey reports. Due to the nature of Lake County soils and the many depressional areas in the topography, water management, sewage disposal, and pollution can be major problems. Interpretation of soil facts related to these problems often provides the key to wise decisions.

Author Morris (r.) and Elmer Offerman of SCS examine soil sample indicating an "unbuildable" wet subdivision lot.

Development of rural land beyond the limits of community water supply and sewage disposal facilities puts the burden for providing these necessities on subdividers and individual home builders. There are more than 25,000 individual sewage disposal systems in Lake County. The Health Department gets approximately 800 new requests each year for approval of septic tank installations.

The standard procedure on such requests has been to conduct soil percolation tests as developed by the U. S. Department of Health,

The author is sanitary engineer, Lake County Health Department, Waukegan, Ill.

Education, and Welfare. This test calls for determination of a site's suitability, by measuring the rate of water-level drop in minutes-per-inch in six test holes which have been presoaked for 4 to 24 hours.

The Department's experience indicates that the percolation test method has shortcomings. Among them are:

(1) Inability to recognize soils subject to intermittent high water tables.

(2) Inability to recognize an abnormal soil condition, such as dry-weather cracks, root channels, and worm holes, that cause percolation rates not representative of the soil area as a whole.

(3) Low confidence possible in the percolation rate established by the test, because each site must be treated as an individual and distinctly separate situation rather than as a representative site.

(4) Expense of the testing procedure—high for both the inspecting agency and the owner of the site.

(5) Dependence of the test on weather conditions, with interference from freezing weather and rain.

In an effort to improve on the existing test procedure, the Lake County Health Department and the Soil Conservation Service cooperatively studied the use of soil maps as a means of determining soil suitability for individual soil-absorption sewage disposal systems. The SCS prepared a soil map for Ela Township, and similar mapping is now being done throughout the county.

There is enough homogeneity in soil types mapped to permit the making of predictions about soil behavior. A comparative analysis of the results of percolation tests and laboratory hydraulic conductivity tests (Uhland core method) indicates that any particular soil type consistently performs in a similar manner for both of the tests.

In light of this favorable comparison, a statistical analysis of the Lake County Health Department's test data was made on seven selected soil types. The analysis indicated that after sufficient tests (30, with 6 percolation runs at 5 soil sites) were averaged, a percolation rate could be assigned to a soil. A Health Department staff member then reviewed septic tank installations in areas where the soil type had been established. It was found that those soils having satisfactorily predicted percolation rates were providing satisfactory performance after at least 1 year of use.

As a result of our studies, we were able to sum up the following advantages from use of soil maps:

(1) Interpretations of the soil-mapping unit will indicate whether the soil at a particular site is subject to an intermittent high water table. This will avoid the criticism of variability of the percolation test rates, resulting from the tests' being conducted during different seasons of the year.

(2) The suitability of a site can be based on the performance of the soil type at five, or probably more, other site locations instead of merely the six test holes on one site. By this method the confidence limits would be improved from 30 to 95 percent.

Newly excavated basement filled with water from high water table.

One of 3 lakes developed on wet Class V land in Lake County's Hawthorn Woods subdivision for swimming, fishing, and winter sports.

This septic tank failed because of soil conditions, and fluid comes to surface below filter field in foreground.

(3) The use of soil maps will permit the determination of site suitability for the correlated soil types regardless of the time of the year at which the request for determination is made.

(4) Presently, the cost to the property owner for a percolation test varies from $35 to $75. Assuming the average size of a homesite to be ½ acre, the cost of determining the site suitability is presently costing approximately $100 an acre, as compared to 30 cents an acre through the use of soil maps! In addition, soil maps provide much additional valuable information not gained through the percolation test.

The use of soil maps will not provide a panacea for the problem of determining site suitability for soil-absorption sewage disposal systems. The method will be most effective in reviewing large land areas, such as an area proposed for new subdivision development. In the case of small individual lots, the scale of the soil survey may not allow accurate location. A lot located on a transitional soil area may require field investigation.

In the case of existing subdivisions, the natural soils may have been disturbed so that the soil maps may not be accurate. In the case of proposed subdivisions requiring a considerable amount of site stripping and grading, a large portion of the soil map would be invalidated. In other words, the soil maps reflect the natural soil landscape found at the time the maps were prepared.

As a result of progress made in getting reliable results with soil survey information, we have designated the village of Hawthorn Woods in Ela Township as a test village, in which permits for new septic tank installations will be granted on the basis of information in the township soil map rather than percolation tests.

We are making the transition away from percolation tests gradually, as our experience increases. We are currently taking photos of the soils map and projecting them on a county tax map. With a table of percolation rates, we can give an informed answer right on the spot.

There are many other applications of soil data to health problems. One of them is in the construction and maintenance of sanitary landfills. We had a good example not long ago. Pits had been dug very deep and used for borrow. Probably because of intermittent changes in the water table, the ground water came up, leaching the buried refuse. The odor, primarily of hydrogen sulfide, persisted for months and was almost unbearable. The pits were near several commercial buildings, and their owners complained bitterly of the effect on business. We have a system of review for proposed landfills; and with the soils information, we now have another valuable tool to help with our decisions.

Location of sewage lagoons offers another application of the soils information. Even if the percolation is such that there is danger of leakage into surrounding soils, knowledge of other soils in the vicinity sometimes makes it possible to bring in impervious material from a nearby source to act as a sealer.

In Lake County, wells are the principal source of water supply. With a rapid percolation rate near septic tank installations, they have easily become contaminated, particularly where there is a high water table.

Proper location of sewerlines is also important, and stability of the soil is one of the factors. If there is settling, the gradeline is interrupted.

Lake County is famous for its Fox Lake and the chain of lakes that continues into Wisconsin. This is an area where better understanding of the nature of soils, erosion sources, pollution sources, algae production, and their interrelationships could have a tremendous effect. Recreation is a big business here, but its future is threatened by lack of knowledge of health problems and a need for cooperation.

In my opinion, soils evaluation can make a signficant contribution in improving the urban environment, particularly if used early in

the evolution of the home and industry pattern. Many things go into consideration of the total health and welfare of an individual or a city, and making any choice usually involves a compromise. Factors include economics, esthetics, public convenience, availability, and physical suitability. The best choice can be made when all factors involved are recognized and information is readily available on which to base judgment.

Soils facts are a source of help we can't afford to ignore.

Urban Growth Spurs Planners To Look for Basic Land Facts

By Frank S. So

PRACTICAL considerations are causing urban planning agencies and public officials throughout the Nation to make increasing use of soil surveys. Faced with a growing urban population that is turning farms into residential subdivisions, shopping centers, and industrial districts, the planner needs information about the basic resource being consumed—the land.

The use of soil information by officials interested in guiding urban growth follows somewhat the the same historical sort of development as happened in the use of topographic information. In the past, developments were planned on a rectilinear block pattern without regard to topography. Now streets and lots are arranged so as to follow topographic lines (the agricultural equivalent of contour plowing). Similarly, the planner now sees that the character of the soil also makes a difference in how land can be developed.

What are some of the urban development problems that can be eliminated or lessened through the use of soil surveys?

Perhaps the key problem is related to sewage disposal. Urbanization has taken place so fast and in such a sprawling pattern that

Author So includes soils information in dictating planning report to his Chicago office.

the septic tank has become a part of the American way of life. Unfortunately, the septic tank's leaching fields are clogged too much of the time in too many locations. Hand in hand with the septic tank problem comes the pollution of underground water sources that supply domestic wells. Inefficient sewage disposal methods have also polluted many small lakes and streams. Other areas are plagued by flooded basements, standing water that becomes stagnant, cracked foundations, crumbling driveways, eroding slopes, or yards in which neither grass nor trees can grow.

In many of our communities, local roads periodically crumble because of subpavement earth slippage. Even portions of major highways have had to be rebuilt because of poor soil conditions. Other highway projects have been delayed for long periods, while costs have soared as piling or retaining walls were suddenly found necessary across stretches characterized by subsoil instability.

Similarly, the foundations of public buildings have failed, and underground utilities have been corroded. Haphazard development of upstream areas has contributed to damaging floods at downstream locations.

Of course, many such problems are of an engineering nature and cannot be completely solved without detailed onsite study. Although urban planning operates on a more general community- or region-wide basis, it is possible to predict in advance where problems are likely to occur. In terms of a comprehensive planning program, the soil survey falls into the category of basic studies that precede planning, such as studies

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Homeowners learned too late this Lake County land was subject to flooding. Soil survey information could have led them to higher ground.

of population, economic character, existing land use, and the physical setting of the community. The soil survey falls into the last category of basic studies and is related to studies of the natural environment—terrain, drainage patterns, water supply, climate, and the like.

In the past, soil information was not used to a great extent, because many of the maps in earlier surveys were made on a small scale and were not interpreted for urban purposes. Today, this is not the case. The Soil Conservation Service has been steadily increasing its interest in urban-growth problems, and the result has been a speedup of surveys for which it is responsible in areas experiencing urban growth as well as developing more urban-oriented interpretations. Planning agencies have been vigorous in using the information.

The following are only a few of the examples of work that is being carried on in different parts of the country:

The Northeastern Illinois Metropolitan Area Planning Commission published a soils report based on generalized maps as one of its first studies after its establishment. The information has since been used to advantage in subsequent work, such as planning for refuse disposal sites and open space for recreation. In addition, one of the member counties has been working very actively with SCS officials in detailed soil mapping.

The Southeastern Wisconsin Regional Planning Commission, covering a 7-county area, has felt that soils information is so important in its planning program that it has contracted with the SCS to place additional men in the field in order to complete surveys in time to be of use in planning land use, transportation facilities, utilities, and other community facilities. Almost 40 percent of the land area has been covered with detailed soil surveys, but entirely new surveys will be needed on about 1 million acres.

The Tri-County Regional Planning Commission in the vicinity of Akron, Ohio, has published a report based on both general and detailed maps, as has the Stark County (Ohio) Regional Planning Commission. The Penn-Jersey Transportation Study is experimenting with soil suitability ratings based on soil surveys which will be used as "inputs" in the construction of a "regional growth model." On the west coast various planning agencies in the Puget Sound region are using soil data to forecast land use, as useful information in zoning and subdivision control, as well as for use in public health controls.

Numerous additional planning agencies could be added to this list, from Texas, Michigan, Ohio, Virginia, Kentucky, Florida, and some New England States. Why should these groups be so enthusiastic about the new soil surveys that are being made? Perhaps the best answer is that such information has been needed for some time to solve planning problems, and the SCS, in cooperation with urban planners and construction engineers, has been engaged in efforts to interpret basic soil data for urban land-use suitabilities.

Any planner glancing through a modern detailed published soil survey with urban interpretations will be quick to grasp the potential of such information in a planning program. He will see that a great deal of work has been done in adapting soil information for land-development purposes. The soil maps are extremely legible, with fine lines superimposed over high-quality printed aerial photographs, on a scale that would make neighborhood-size site review possible.

The modern soil survey has information about the major kinds of soil that occur in the area, with descriptions of their structure, texture, and other physical characteristics. Information, measurements, estimates, and interpretations are then presented for a host of characteristics including, but not limited to:

Porosity and percolation rates, drainage, ponding, flooding, runoff, depths to bedrock and water tables, bearing strength, shrinkage and swelling, corrosion, frost action, and erosion. These characteristics are then translated into suitability ratings (e. g., most

favorable, very favorable, favorable, somewhat favorable, unfavorable) for various land uses such as low or high density residential, industrial, commercial, transportation, and developed and undeveloped recreational areas.

It doesn't take very long to see that soil surveys not only can give the planner information about which areas will be suitable for the use of septic tanks, but are useful in answering such varied questions as: Should a particular piece of open space be developed as a camping area or a golf course? What areas should be avoided in laying a new trunk sewerline? Which areas would be most suitable for industry? What areas present problems for any kind of urban development? If we do not have flood records for certain streams, how much do we know about the flood potential of adjacent land?

These kinds of questions and arguments for the usefulness of soil surveys in an urban planning program have been well summarized in a staff memorandum of the Southeastern Wisconsin Regional Planning Commission. It states that a soil study is being conducted which can be used to:

(1) Aid in selecting and developing desirable spacial distribution patterns for industrial, commerical, agricultural, residential, and recreational development.

(2) Make preliminary estimates of the engineering properties of soils that will aid in selecting highway, railway, airport, pipeline, and cable locations, and in planning detailed soils investigations for route location studies.

(3) Make preliminary estimates of the agricultural and natural wildlife relationship properties of soils that will aid in planning for the reservation of permanent agricultural and recreational green belts and open spaces.

(4) Make preliminary estimates of the suitability of soils for private sewage disposal facilities, agricultural and urban drainage systems, foundations for buildings and structures, including transportation facilities, and water-storage reservoirs and embankments; and make determinations of the need for soil and water-management practices such as erosion control and drainage required in connection with planned development.

(5) Locate potential sources of sand, gravel, and other mineral resources.

(6) Correlate performance of engineering properties with kinds of soil to develop information for broad, area-wide land-use planning.

By almost any standard of measurement, a good start has been made toward increased joint efforts of soil scientists and urban planners in working together in providing information that is important and useful in guiding and shaping urban growth. With the kind of knowledge about the land that is now being developed, urban planning and development decisions can be made on a sounder, more rational basis.

Timberlake subdivision developer located Wauconda Township homes on high ground and lake in low area. Soil surveys guide similar good planning.

This is how metropolitan-area housing is taking over good Class I and II farmland in Cook County around Chicago and in the environs of other cities.

Conservation District Program Serves Rural and Urban People

By Elmer E. Offerman

SWCD Secretary Henry Schaeppi (r.) and Author Offerman consider other uses for peat area not recommended for home building.

EACH day brings a new problem and a new opportunity for me as a work unit conservationist of the Soil Conservation Service to be of assistance to a wide variety of users of land and water resources in a rural-urban county.

Our Lake Zurich work unit comprises Lake County and part of Cook County, Ill., in the Chicago metropolitan area. The area is experiencing urban expansion. As a result, we in the work unit office and the SCS area office in Kankakee are working with officials on all levels of government—village, township, county, intercounty, and metropolitan. The type of information and help provided varies, because each unit of government has its own responsibilities in the field of planning and zoning.

The Lake County Soil and Water Conservation District was organized in 1958. It was one of the last to be formed in Illinois, because some people thought there was no need for such a district in our county, as it soon would be all covered with houses, factories, and shopping centers. Others said: "Why organize a district? It's only for farmers."

The progressive leadership of the county realized, however, that while it is in the metropolitan area, it is still primarily an agricultural county. Nearly three-fourths of the land is still in agriculture or other open-type use. The sale of scattered farms for urban purposes tends to excite local residents, but does not mean that agriculture is doomed.

The belief that a soil and water conservation district is only for farmers likewise has been proved wrong, as we are providing significant services to both agricultural and urban interests. The Lake County district's board members have developed a program that recognizes their responsibility to help all land users. Their objective is the best use of each and every acre of land, in urban as well as rural areas.

They also were aware from the start that urban development would not be as rapid and land-consuming as some promoters would like everyone to believe. One member of the board remembers the experience of his own family, who sold the home farm in the late 1920's, only to see just such a promoter's grandiose plan fade. After the family repossessed the land, they had the novel experience of farming around fire hydrants and waterlines. This farm finally was sold again, in 1960, for urban development.

The board also realized that soil erosion on urban land contributes to siltation of reservoirs, streams, and lakes and that runoff helps create flood problems. It accordingly has made available, any information it has that zoning officials, planners, and others can use to solve or prevent their land-use problems.

Interest was developed among urban leaders by means of a tour held in the fall of 1959 for the Commissioners of the Lake County Regional Planning Commission, the chief sanitary engineer for the Health Department, district directors, and SCS personnel. On this tour, we studied soils subject to flooding, soils impervious to water, high water-table soils, and those which have poor bearing strength for structures.

The chief soil problems growing out of these varied soil conditions in our urban community include: The individual home septic system which fails to function in the spring of the year; homes with the basement full of water; and entire subdivisions which have been flooded, requiring evacuation of the residents. Also, many homes with cracked foundations and walls, and roads which have become nearly impassible because of poor soil conditions affecting their construction and maintenance.

These problems have become our challenge, and we are making some progress with them. John Quay, chairman of the Ela Area Planning Board, took the initiative and contacted my office the afternoon after the tour. Based on his visit and several followup meetings, we developed a cost-sharing arrangement for mapping the township's soils. The cost of the fieldwork was shared jointly by the Lake County Health Department and the Lake County Regional Planning Commission. Cost-sharing was necessary, because this was a speedup program beyond the normal load of district cooperators' request for soil surveys.

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The field mapping, completed in 1960, was a standard soil survey; but soil scientists sensed the importance of the pilot project and were especially alert to conditions which would have influence on urban living and use of the land. The fieldwork was followed with a series of discussions and meetings, at which time an interpretation report was developed. It was presented formally to the County Board of Supervisors and interested organizations in an afternoon meeting on March 15, 1962. Some 100 local residents heard an explanation of the report at an evening meeting in Ela Township.

Even before this report was released, adjoining Vernon Township signed an agreement to have its entire acreage mapped on a cost-sharing arrangement. The pioneering activities of these two townships focused attention on the use of soil information as a basic guide to urban planning. The County Board of Supervisors was among the first to recognize its value, and on January 1, 1963, developed a cost-sharing agreement with the SCS to complete soil mapping of the county by 1966. A total of $24,000 has been contributed for cost-sharing soil surveys in Lake County.

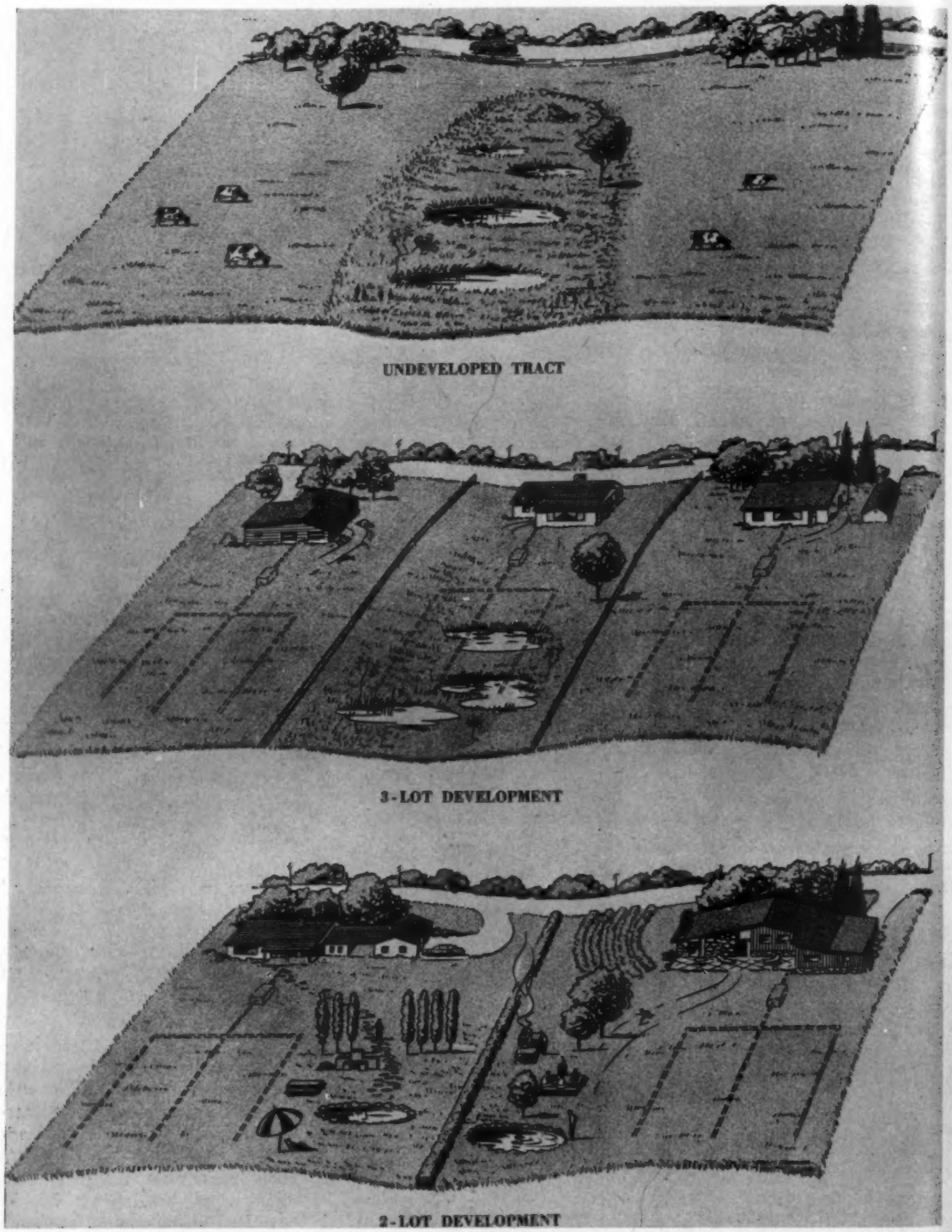
Lake Couny SWCD Board must solve many knotty urban problems as well as farm conservation problems, because of district's proximity to Chicago. L. to r.: —Paul Waters (SCS), Stanley Faulkner, Chairman S. Burton Lee, Henry Knigge, Arthur Bucher.

Requests for SCS and district help increase as the soil information is made available township by township. The assistance given the Long Grove Country Club Estates is one example. The contacts we had with this development resulted in basic changes to the layout. The soils information was interpreted for the developer so the problem areas could be readily seen. When this plat was finally approved by the village board, the land-use pattern of this more than 500 acres of land was set for many years, illustrating the fact that decisions that we are helping urban users make are not as subject to change as those on the agricultural land.

Many of our requests are handled on a consultation basis. Representative was a request for help on a 35-acre lake that the district handled by meeting with the owners and their private engineer. The needed survey information was obtained by the private engineer, and it was arranged for our area engineer to consult with him on the design. In another instance, a group of 12 property owners was interested in a preliminary report and feasibility study for a 150-acre lake. This report was made. Future engineering assistance will be obtained from a private engineer.

Our accomplishments in the use of soils information in the urban area have been due to the interest and understanding of local leaders and governmental officials. And it is in the communities where the local people are interested in high quality urban-area growth that we have experienced its most effective use.

Seriously eroded subdivision lots, where septic systems failed to work and property was allowed to run down.



2 for 3 is better planning.—Crowding homesites oftentimes cause septic-system and other problems, as in the 3-lot arrangement (center). Larger lots give owners more room to locate their filter fields and beautify their property (bottom).

SOIL SURVEYS 'MOVE TO TOWN'

By A. A. Klingebiel

KNOWING what kind of soil with which they have to work is of first importance to all manner of urban and rural planning and construction people.

In addition to farmers—for whose guidance soil surveys originally were developed—homeowners, construction engineers, planners, and a host of others have found they benefit from the use of modern soil surveys. The depth to bedrock or to a water table is equally important to a construction engineer in selecting a building site as it is in determining the kind of crops, grass, or trees to grow, or how to locate and build farm ponds, terraces and diversions, or other conservation structural works.

This and other information is brought out in the soil surveys, which are drawn upon in soil and water conservation districts' farm and ranch planning, in planning and construction in small-watershed protection and flood prevention projects, and in urban-area development. In urban-area use, for example, the surveys disclose soils that are slowly permeable to water or those that are subject to overflow and have severe limitations for use as homesites as well as for growing many kinds of plants.

These facts about soils can be learned from soil maps made through the National Cooperative Soil Survey and published by the Soil Conservation Service of the U.S. Department of Agriculture. In the early work in soil survey, soils were mapped, described, and studied to find out how well they were suited to different crops, and how each kind of soil should be treated to get a sustained yield. The benefits of this work soon reached beyond the farmers. Today, some of the most enthusiastic users of soil maps are engineers, planners, and local officials responsible for suburban developments and highway construction.

Fortunately, this new use of soil maps was made possible by the increasing demands of farmers. Modern farming requires more and more detailed soil maps and more precise interpretations of the way each kind of soil will perform. The soil properties that affect agricultural uses are the same ones that affect the suitability of the soil for urban uses.

The same basic principles that made our agriculture so productive can be applied to urban areas equally well. The interpretations are different; but they go back to the same basic principles of soil physics—water movement, shrink-swell potential, susceptibility to erosion, and other properties. In either case, our first job is to know the kind of soil, and then to make the interpretations for the intended use. Thus, the modern soil maps, though prepared primarily for farmers, can be interpreted for suburban planning, soil engineering, and for many other uses. Today's soil surveys are designed to meet the needs of the many users.

In making the maps, the soil scientist walks over the land, studying the soils, vegetation, and other features of the landscape. He identifies the different soils by digging numerous holes and examining the different layers of soil, usually to a depth of 5 feet. Using his knowledge about soils and their behavior, he classifies the different kinds of soil and records their boundaries on an aerial photograph. A separate symbol is used to identify each different kind of soil, which is described in terms that have special meaning to soil scientists.

The properties of each of the soils are compared with those that have been described and named in the national soil classification system. If the soil does not differ significantly from one already classified, then the soil is given the name of that classified soil. If the soil is unlike all others classified to date, it is given a new name. A uniform system of soil classification is followed in the United States, so that all soils that are alike have the same name.

By recording the behavior of the

Wet-area cattails—Nature's warning to check soil surveys before building!

Structural failures like this in buildings on unstable soils are costly for homeowners.

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different kinds of soil, we can assemble useful data about each of the soils that is named and classified. Some of these data are obtained from carefully controlled experiments conducted in the laboratory or in the field. Other information is obtained from the experiences of farmers, engineers, and others who work with the soil. Through the use of a soil map, this information can be applied to other areas having the same kind of soil. In this way, experience and experimental data gained in one area of a named soil can be conveniently extended to another area of the same kind of soil.

Soil maps are made at varying degrees of detail according to the intended use. A general soil map can be made quickly to show only the main patterns of different kinds of soil as they occur in large segments of the landscape. On such a map, planners can pick out large areas of soil subject to flooding or of questionable suitability for sewage disposal or foundations. These maps normally cover a county or township; nevertheless, many questionable areas or problem areas will show up in areas as small as 300 acres. They are useful for broad general planning purposes.

The detailed soil map, usually at a scale of 4 inches to the mile or greater, separates different kinds of soils in areas as small as 1 or 2 acres. The delineations on a survey of this kind reflect differences in soil texture, structure, acidity or alkalinity, thickness, permeability, moisture capacity, and many other properties significant in detailed urban planning. Soil maps at this scale are accurate to within several acres, but it is not feasible to show the precise boundary of each kind of soil. It usually is advisable to make some onsite evaluations before construction sites are finally selected. These maps are suitable for operational planning.

Lawrence Benson, now WUC at Geneva, examining Ogle County soil for recording on aerial photo that became soil map of area.

A detailed soil map can serve the urban planner as a blueprint of the land. It will help him in making wise choices among alternative uses, and assist him in resisting pressures from those who have short-term objectives or are poorly informed. The soil map can be interpreted to show the soils that are good sites for roads, private dwellings, schools, septic fields, commercial areas, parks, and other urban facilities. It shows, also, soils not suited. But the soils ill-suited to homes, schools, or other buildings well may be suited as sites for parks, golf courses, wildlife sanctuaries, plant nurseries, or agricultural crops.

Soil maps have been published for more than 2,000 counties and areas. Our knowledge about soils and their management has increased rapidly in the last 25 years. Consequently, the recently published soil surveys contain detailed soil maps and specific interpretations for many different users.

Soil mapping is now going forward, or has been completed, in approximately 2,940 soil and water conservation districts that take in nearly all farms and ranches of the 50 States, Puerto Rico, and the Virgin Islands. In 1962, about 60 million acres were mapped. More than 1,500 trained soil scientists carry on this work.